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## Effort-reward imbalance and work-home interference: a two-wave study among European male nurses

Marjan J. Gorgievski <sup>a</sup>, Beatrice I. J. M. Van der Heijden <sup>b,c,d</sup> and Arnold B. Bakker <sup>a,e</sup>

<sup>a</sup>Center of Excellence for Positive Organizational Psychology, Erasmus University Rotterdam, Rotterdam, the Netherlands; <sup>b</sup>Institute for Management Research, Radboud University, Nijmegen, the Netherlands; <sup>c</sup>School of Management, Open University in the Netherlands, Heerlen, the Netherlands; <sup>d</sup>Kingston Business School, Kingston University, London, UK; <sup>e</sup>Department of Industrial Psychology & People Management, University of Johannesburg, Johannesburg, South Africa

### ABSTRACT

This one-year follow-up study among 1,421 male nurses from seven European countries tested the validity of the Effort-Reward Imbalance (ERI) model in predicting prospective vital exhaustion and work-home interference. We hypothesised that effort and lack of reward would have both main and interactive effects on future outcomes. Results of structural equation modelling (SEM) showed that effort was positively related to exhaustion and work-home interference, both simultaneously and over time. Lack of reward predicted increased exhaustion at follow-up, but effort-reward imbalance did *not* influence the outcomes. Additionally, Time 1 exhaustion predicted increased work-home interference and exhaustion at follow-up. These results do not support the ERI model, which postulates a primacy of effort-reward imbalance over main effects. Instead, the findings are in line with dual path models of job stress and work-home interference. Multi-group SEM showed partial cross-cultural metric invariance for the ERI measure of effort, but the ERI measure of rewards showed no metric measurement invariance, indicating its meaning is qualitatively different across cultures. Nevertheless, the main conclusions were markedly similar for each national sub-sample. We discuss the theoretical and practical implications of our study.

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Effort-reward imbalance model; cross-cultural equivalence; exhaustion; work-home interference; male nurses; nursing

During the past decades, Europe has faced a substantial shortage of nurses, which is not expected to improve in the short run (Chan, Tam, Lung, Wong, & Chau, 2013). Due to demographic changes in European populations, the need for care is increasing. Simultaneously, the nursing population is aging as the “baby boomer” generation approaches retirement age. Retention of trained and highly qualified nurses remains of utmost importance, yet premature professional turnover is high (Buchan, Duffield, & Jordan, 2015). Nursing is a highly demanding profession, which is traditionally characterised by huge levels of emotional, cognitive and physical strain (e.g. Aiken et al., 2001; Bakker, Killmer, Siegrist, & Schaufeli, 2000; Mark & Smith, 2012). Job stress built up during

**CONTACT** Marjan J. Gorgievski  [Gorgievski@fsw.eur.nl](mailto:Gorgievski@fsw.eur.nl), [Gorgievski@ESSB.EUR.NL](mailto:Gorgievski@ESSB.EUR.NL)

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work hours may lead to work-home interference and hamper optimal functioning at home, causing even more strain (Homburg, Van der Heijden, & Valkenburg, 2013; Van der Heijden, Demerouti, & Bakker, 2008). Empirical evidence from scholarly work worldwide shows that the nursing profession brings about high risks for health deterioration, relating to premature leave from the nursing profession and impaired patient care (Aiken et al., 2001). Research contributing to the prevention of impaired health and work-home interference therefore remains urgent in order to promote sustainability of the workforce and attractiveness of the profession.

The current study addresses male nurses from seven European countries. Because the nursing profession is highly female dominated, men typically formed only a fraction of previous research samples. That is to say, male nurses are a relatively under-researched population. Hence, prior results may not necessarily generalise to male populations. Moreover, the awareness that health care providers should reflect the diversity in the patient population in order to improve the quality of health care and patient outcomes (Abshire et al., 2017) is an important argument for the retention of male nurses in specific. Moreover, premature leave from the nursing profession is even higher for male than for female nurses (Chan et al., 2013).

Building on the effort-reward imbalance (ERI) model (Siegrist, 1996; Siegrist & Li, 2016), this study investigates simultaneous and longitudinal relationships between effort, lack of reward, and effort-reward imbalance at work as possible predictors of vital exhaustion and work-home interference. The ERI model is particularly suited for the purpose of this study, because of its unique focus on the rewards employees receive in return for efforts expended at the job, including money, esteem, and career opportunities. Qualitative research has shown that next to the unfavourable impact of job stressors on long-term health, a serious lack of job benefits and recognition are the most important reasons for men to leave the profession (Rajacich, Kane, Williston, & Cameron, 2013).

The theoretical contribution of our study is threefold. First, substantial literature exists relating effort-reward imbalance to health outcomes such as cardio-vascular problems, musculoskeletal pain, vital exhaustion, and burnout, as well as to behavioural outcomes, such as sickness absence (Eddy, Heckenberg, Wertheim, Kent, & Wright, 2016; Gilbert-Ouimet, Trudel, Brisson, Milot, & Vézina, 2014; Koch, Schablon, Latza, & Nienhaus, 2014; Van Vegchel, De Jonge, Bosma, & Schaufeli, 2005). However, most of these studies used a cross-sectional design, thus providing no evidence for possible causal relationships. Moreover, previous studies have rarely investigated the separate, additive effects of effort, lack of reward, and effort-reward imbalance, because of which little empirical evidence exists for the basic premises of the model (Van Vegchel, De Jonge, & Landsbergis, 2005). Utilising a one-year follow-up study design and moderated structural equation modelling, our study aims to fill this void.

Second, our study will improve insights into the relationships between effort-reward imbalance and work-home interference. Increased women's empowerment, meaning equal access to opportunities and resources in terms of education, employment and economic participation, has made work-home interference an equally important issue for both men and women (Ruppanner, 2011). For male nurses in particular, role stressors and difficulties in career development have been identified as important risk factors for burnout (Hsu, Chen, Yu, & Lou, 2010). Other studies have shown that work-home interference is an important predictor of psychological and emotional distress, absenteeism and

turnover (Ten Brummelhuis, Bakker, & Euwema, 2010). As studies relating ERI and work-home interference are scarce (see for some exemplary exceptions; Hämmig, Brauchli, & Bauer, 2012; Shimazu, Bakker, Demerouti, & Peeters, 2010; Willis, O'Connor, & Smith, 2008), we aim to extend this line of research by incorporating both effort-reward imbalance and work-home interference in one and the same empirical model.

Third, our sample enables us to attest generalizability of results across countries. The countries in our sample differ, for example, in unemployment rates, Gross Domestic Product (Eurostat, 2017), welfare state regimes (Ebbinghaus, 2012) and national values (Inglehart & Welzel, 2010). These characteristics can be expected to influence nurses' job design preferences and their reactions to it (Parker, Van den Broeck, & Holman, 2016).

## Theoretical background

### *Effort-Reward imbalance*

This article builds on the ERI model, which was developed in the 1990s and has remained popular till to date (Siegrist, 1996; Siegrist & Li, 2016). The ERI model emphasises social exchange processes between employees and the companies they work for. The basic premise of the ERI model is that people exert effort on their job, expecting to receive certain rewards in return, specifically money, esteem and job security. In case of a digression from reciprocity between effort and reward, employees' expectations are being violated, which is assumed to lead to strain. The model contains a so-called "external effort-reward imbalance thesis", which focuses on the transactions between extrinsic effort and extrinsic reward. Extrinsic effort in the nursing profession includes working under time pressure, interruptions, carrying responsibility, working overtime and physical demands. Extrinsic reward includes respect and support from superiors and (close) colleagues, job security, promotion opportunities, fair treatment and pay, and applicability of education and training on the job (Lavoie-Tremblay, Wright, Desforges, Marchionni, & Drevniok, 2008). The ERI model also has an "intrinsic imbalance" component, focusing on personal differences related to employees' job involvement and internally driven personal investments at work.

This study focuses on the so-called "extrinsic imbalance thesis", which is about aspects of the job that can more easily be influenced by the organisation and its managers. Our first hypothesis is that (extrinsic) effort-reward imbalance predicts vital exhaustion. The relationship leading from effort-reward imbalance to impaired health complaints has received ample attention in occupational health research (e.g. Feldt et al., 2013; Lavoie-Tremblay et al., 2008; Sembajwe et al., 2012; Van Vegchel, De Jonge, Bosma, et al., 2005). This effect is generally understood as resulting from experienced negative emotions, such as anger and frustration related to failed reciprocity. In turn, these experienced negative emotions may lead to accompanying physiological stress responses that, in the long run, may trigger the development of stress-related disorders (Siegrist, 1996).

Although Siegrist (1996) acknowledges that main effects of effort and lack of reward may occur, the ERI model specifically identifies effort-reward *imbalance* as the crucial factor predicting strain. In this respect, it differs from other occupational health models, such as the Job Demands-Resources (JD-R) model (Bakker & Demerouti, 2014). According to these other models, exerting effort to meet the demands of the job is considered to be the most

important predictor of an energy depletion process leading to long-term strain and impaired health. Energy depletion can be seen as a resultant of performance protection strategies (cf. Hockey, 1993, 1997; Van der Heijden et al., 2008). People perform tasks and meet goals by mobilising energy. Under optimal circumstances, this energy is mobilised through sympathetic (autonomic and endocrine) activation. In case of suboptimal conditions, such as too many environmental stressors or time pressure, people can consciously exert extra, compensatory effort in order to prevent performance impairment. The greater the effort, the greater the physiological costs, such as increased allostatic load. This means that the body is in balance, but shows an elevated physiology (e.g. a high blood pressure) and cognitive strategic adjustments (selectivity and narrowing of attention), which cause fatigue-related complaints both in the short and long run (Hockey, 1997). The ratio term of the ERI model implies that if the reward is sufficient, strain will not raise very sharply with increasing effort (Van Vegchel, De Jonge, & Landsbergis, 2005). However, it seems unlikely that being rewarded sufficiently in terms of money, esteem or job security would buffer the effects of an energy depletion process. Moreover, following for example JD-R theory (Bakker & Demerouti, 2014) it can be argued that rewarding aspects of the job are resources that are valued in itself. People are motivated to maintain and strive for valued resources. When employees feel their jobs lack sufficient rewarding aspects, it may cause strain in itself, irrespective of the exerted effort.

To date, most studies building on the ERI model have not controlled for main effects of effort and lack of reward in order to investigate if the effect of the imbalance ratio is indeed more than the sum of the main effects. The few studies that did investigate this so-called synergistic interaction effect of effort-reward imbalance showed mixed results. For example, in an empirical study among 405 nursing home nurses (Van Vegchel, De Jonge, & Landsbergis, 2005), the ratio term did not explain any additional variance in exhaustion and psychosomatic health complaints, sickness absence frequency and sickness absence duration, nor did the ratio term explain any additional variance in physical health scores, vital exhaustion, depressed mood and sleep problems in a study among 1,587 predominantly male skilled workers (Preckel, Meinel, Kudielka, Haug, & Fischer, 2007). Some scholars have therefore suggested that the effort-reward imbalance thesis may be unnecessarily complex and therefore redundant (Preckel et al., 2007; Willis et al., 2008). In contrast, in a study among 19,290 registered female hospital nurses, the ratio did explain unique additional variance in intention to leave the nursing profession over time (Li, Galatsch, Siegrist, Müller, & Hasselhorn, 2011). We have therefore formulated Hypotheses 1a to 1c, in order to investigate whether the imbalance between effort and reward explains unique variance in vital exhaustion:

H1a. Effort relates positively to vital exhaustion, simultaneously and one year later.

H1b. Lack of reward relates positively to vital exhaustion, simultaneously and one year later.

H1c. Imbalance between effort and lack of reward relates positively to vital exhaustion, simultaneously and one year later, and over and above the direct effects of effort and lack of reward.

Our second hypothesis is that effort exerted at the job, lack of reward and effort-reward imbalance may lead to negative spill-over into the private domain. Effort such as working overtime may lead to time-based interference of nurses' work with the family

domain. Working overtime typically means less time spent on other activities (Sonnentag & Binnewies, 2013). In addition, strain built up at work through exerted effort, such as fatigue and negative affect, is likely still felt after the work is done (*ibid.*). This may hinder fulfilling requirements at home; a process called strain-based spill-over. Likewise, issues such as a low salary, lack of esteem, and low job security typically keep people occupied after work hours and employees may be less tolerant for intrusion of work into their home lives when the reward is low (Kinman & Jones, 2008). Third, behaviour-based spill-over may occur if employees have trouble switching between different behavioural requirements related to their roles in different domains (Frone, Russell, & Cooper, 1997). In the case of nursing, having to take care of family members may provoke similar behaviours and attitudes towards relatives at home as are required at work, which in some cases negatively influences relationship quality (Ross, Rideout, & Carson, 1996). A study among 1,108 University employees (Kinman & Jones, 2008) indeed showed strong evidence for main effects of effort and lack of reward, and some evidence for an additional interaction effect of a multiplication term of effort and reward on work-life balance. Therefore, we expect that:

H2a. Effort relates positively to work-home interference, simultaneously and one year later.

H2b. Lack of reward relates positively to work-home interference, simultaneously and one year later.

H2c. Imbalance between effort and reward relates positively to work-home interference, simultaneously and one year later, and over and above direct effects of effort and lack of reward.

The next set of hypotheses that will be tested is whether effort, lack of reward and effort-reward imbalance predict work-home interference indirectly over time, through increased exhaustion, or vice versa, whether these variables predict vital exhaustion indirectly over time, through increased work-home interference. Based on theoretical assumptions and previous empirical findings, both mechanisms are plausible. According to the effort-recovery theory (Meijman & Mulder, 1998), long-term effects for health and well-being as a resultant of daily work stress can be alleviated or prevented, if workers have sufficient time to unwind and recover off-work, which will reduce allostatic load (Rodriguez-Muñoz, Sanz-Vergel, Demerouti, & Bakker, 2012). However, recovery is impaired if work demands spill over into the private domain, thus leaving less opportunities for recovery, in specific detachment from work and relaxation (Feldt et al., 2013). For instance, working overtime may mean less time spent on leisure activities (Unger, Niessen, Sonnentag, & Neff, 2014). Lack of recovery due to work-home interference may lead to an accumulation of strain, resulting in increased vital exhaustion over time. Feldt et al. (2013) have indeed shown that managers who reported low (versus high) effort-reward imbalance and low (versus high) over-commitment reported the highest levels of psychological detachment and relaxation and the lowest scores on burnout. An overview of the literature identified seven longitudinal studies showing empirical evidence for the contention that stressful work characteristics predict work-home interference, which in turn predict impaired worker well-being (see Van der Heijden et al., 2008). In addition, a one-year follow-up study performed by Van der Heijden et al. (2008) among 753 Dutch nurses from different occupational settings showed that job demands predicted work-home interference, which in turn, predicted general health complaints.

In contrast, according to the dual process model of work-home interference (Bakker & Geurts, 2004), the demanding aspects of work (i.e. effort), are expected to predict exhaustion first, which in turn are expected to lead to negative work-home interference. This is in line with the process of strain-based spill-over described before, which is not only expected to occur in the short term, but also over longer periods of time. A recent meta-analysis on the reciprocal effects between strain and work-home interference (Nohe, Meier, Sonntag, & Michel, 2014) showed that the cross-lagged effects between strain and work-home interference were of equal strength. Hence, we hypothesise the following:

H3a. Effort, lack of reward and effort-reward imbalance relate positively to work-home interference one year later via vital exhaustion.

H3b. Effort, lack of reward and effort-reward imbalance relate positively to vital exhaustion one year later via work-home interference.

The final aim of our study is to attest cross-national generalizability of our findings. The wide international use of the original ERI instrument and the large body of empirical evidence to date as regards outcomes, as well as the (limited) evidence on measurement equivalence of the ERI measure (e.g. De Jonge, Van der Linden, Schaufeli, Peter, & Siegrist, 2008; Rantanen, Feldt, Hyvönen, Kinnunen, & Mäkikangas, 2013) do not immediately give raise to expect systematic differences, thus we hypothesise:

H4a. The factorial structure of the ERI measure is invariant across national samples.

H4b. The final structural model of relationships is invariant across national samples.

## Method

### *Participants and procedure*

Participants were 1,421 male nurses from Belgium ( $N = 115$ ), France ( $N = 115$ ), Germany ( $N = 247$ ), Italy ( $N = 855$ ), the Netherlands ( $N = 66$ ), Poland ( $N = 16$ ), and Slovakia ( $N = 7$ ) who took part in a large longitudinal European study on correlates of nurses' intention to leave the profession (Nurses Exit; NEXT). They were recruited from different types of institutions (hospitals, nursing homes, and home care institutions) across different geographical regions, and worked in the same organisation across the two time points. The NEXT study design was approved by the ethics committee of the University of Wuppertal in Germany. In all countries, employers and employee representatives gave official consent for participation (Hasselhorn, Müller, & Tackenberg, 2005).

Nurses filled out paper-and-pencil questionnaires that were sent directly to their homes. At T1, 3,483 male nurses participated (response rate 51%). Only respondents who participated at T1 received the follow-up questionnaire at T2. ||At T2, 1,421 questionnaires were returned (response rate 40.80%). Missing values were treated using the Full Information Maximum Likelihood Method, which is superior in case these values are not missing at random (Enders, 2010). Participants were on average 38.85 years of age ( $sd = 8.68$ ), 193 (13.6%) of participants lived alone; 782 (57.5%) had children at home (range 1 to 9;  $M = 1.04$ ,  $sd = 1.13$ ); and 138 (9.7%) additionally had other caring responsibilities. The average number of contract hours the participants worked per week was 35.94 ( $sd = 3.73$ ) and additionally they worked 1.99 hrs ( $sd = 3.98$ ) overtime. Compared



to participants of both data waves, drop-outs scored slightly lower on lack of reward  $M = 3.31$ ,  $sd = 0.72$  versus  $M = 3.45$ ,  $sd = 0.72$ ,  $F(3090.50, df) = -5.96$ ,  $p < .001$  and higher on exhaustion  $M = 2.26$ ,  $sd = 0.84$  versus  $M = 2.16$ ,  $sd = 0.86$ ,  $F(3382, df) = 3.29$ ,  $p < .01$ .

## Measures

Participants filled out the questionnaires in their own language. All scales were carefully translated using the translation-back-translation methodology for each participating country (Hambleton, 1994), in order to establish conformity of meaning. Scales were thoroughly pretested in pilot studies to ensure good psychometric qualities for each country (for more details see Hasselhorn et al., 2005).

*Effort and Lack of Reward* were measured at Time 1 with the original scales developed by Siegrist and Peter (1996). Two sets of questions were used to measure effort. The first set of six items measured whether the job required putting in certain effort, such as working overtime and carrying responsibility. The second set of questions assessed how much distress was experienced related to the described situations. Answers on these two sets were combined into a score ranging from 1 “no such demand, or leads to no distress at all” to 4 “very much distress”. Lack of reward was measured in a similar vein. Using eleven dichotomous items, the respondents indicated if they received rewards from their job, such as respect from colleagues and adequate salary. Next they were asked to indicate on a four-point Likert scale how much distress they perceived if they did not receive the reward, ranging from 1 “no distress at all” to 4 “very much distress”. When respondents indicated they did receive a reward, distress was coded “1”. Cronbach’s alpha reliabilities (Time 1 only) were .81 for effort and .81 for lack of reward.

*Vital Exhaustion* was measured using the six-item Copenhagen Burnout Inventory (Kristensen, 2000). Respondents were asked to indicate how often they felt “tired”, “physically exhausted”, “emotionally exhausted”, “worn out”, “weak and susceptible to illness” and how often they had thought “they could not take any more”. Answering categories ranged from 1 “never/almost never” to 5 “(almost) every day”. Cronbach’s alpha reliability coefficients were .88 for Time 1 and .88 Time 2.

*Work-Family Interference* was measured using the five-item “work to family conflict” scale developed by Netemeyer, Boles, and McMurrian (1996). Respondents could indicate on a five-point rating scale how accurate statements were in relation to their personal situation, such as: “The amount of time my job takes makes it difficult to fulfil family responsibilities”. Response categories ranged from (1) totally disagree to (5) totally agree. Cronbach’s alpha reliability coefficients were .87 at Time 1 and .86 at Time 2.

## Analyses

The current study applied multi-group Structural Equation Modelling (SEM) methods using Amos 16 (Arbuckle, 2006). In order to test whether effort-reward imbalance predicts additional variance over and above the direct paths of effort and lack of reward, a moderated structural equation model was tested (cf. Marsh, Wen, & Hau, 2004). The goodness-of-fit of the models was evaluated using multiple fit indices (cf., Browne & Cudeck, 1992; Putnick & Bornstein, 2016): the  $\chi^2$  goodness-of-fit statistic, the Tucker Lewis Index (TLI), the Comparative Fit Index (CFI) and the Root Mean Square Error



of Approximation (RMSEA). TLI and CFI close to or larger than .95 in combination with  $RMSEA \leq .05$  indicate good fit.

## Results

### *Measurement model and descriptive statistics*

Before testing our hypotheses, we tested a measurement model. The latent variable “effort” was indicated by its six individual items. The latent variable “lack of reward” was indicated by item parcels belonging to the three sub-dimensions “esteem”, “career possibilities” and “security”. Prior research has shown that these three sub-dimensions can validly and reliably be identified across cultures (De Jonge et al., 2008). The latent variables “exhaustion” and “work-home interference” were each indicated by two parcels comprised of the split halves of the scales. Paths leading from the latent variables to the observed indicators ranged from .52 to .94. Fit of this measurement model was good (see Table 2). Table 1 presents means and standard deviations of the raw variables and correlation coefficients of the latent study variables.

### *Test of the ERI model*

In order to test the hypothesised structural relationships, we added a latent factor “effort-reward imbalance” to the measurement model (cf., Marsh et al., 2004). We followed Siegrist and Peter (1996; see also Montano, Li, & Siegrist, 2016) who advocate calculating a ratio score between effort and lack of reward. We chose to work with item parcels to avoid identification problems when testing the SEM model (Little, Cunningham, Shahar, & Widaman, 2002). We modelled six observed indicators, each comprising the ratio scores of one effort item (mean centred), divided by the total average of the eleven lack of reward items (mean centred). These indicators are based on results of exploratory factor analyses on all 66 possible interaction indicators (cf. Little et al., 2002), which showed that indicators sharing the same numerator comprised similar factors. The factor loadings ranged from .38 for the observed indicator working overtime/lack of reward to .66 for the observed indicator time pressure/lack of reward.

Next, we fitted a number of competing models to the data. First, we tested a baseline model including the covariations between all control variables and independent variables on T1, significant regression paths from control variables to T2 outcome measures, and auto-regression coefficients between the T1 and T2 measures of vital exhaustion and work-home interference. Residuals of vital exhaustion and work-home interference were also allowed to co-vary within measurement moments. The relatively poor model fit (see Table 2) indicated that there was substantial room for improvement, as predicted. Next, we added the hypothesised paths to the baseline model. First, only direct effects were added, which significantly improved the model fit ( $\Delta\chi^2_{(17\ df)} = 1120.06^{***}$ ). Adding effort-reward imbalance did not further improve fit (Full Model; see Table 2).

Results of this Full Model showed full support for Hypothesis 1a: effort related strongly and positively to vital exhaustion, both simultaneously ( $\beta = .58$ ;  $p < .001$ ) and over time ( $\beta = .12$ ;  $p < .05$ ). As concerns the hypothesised effect of lack of reward (H1b), we found only partial support for our assumption. Lack of reward related positively to vital

**Table 1.** Means and standard deviations of the raw scores, correlation coefficients between (latent) study variables ( $N = 1,421$  male nurses).

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	38.85	8.68	–											
2. Education	2.63	0.72	–.10**	–										
3. Number of contract hours	35.94	3.74	–.03	–.05	–									
4. Hours working overtime	1.99	3.98	–.04	.13***	.04	–								
5. Living alone	0.14	0.34	–.16***	.04	–.03	.05	–							
6. Number of children at home	1.04	1.13	.19***	–.08**	.02	–.07*	–.32***	–						
7. Other care responsibilities	0.90	0.30	.12***	–.05	.01	–.01	–.08**	.01	–					
8. T1 Effort	1.82	0.62	–.04	.15***	.08*	.18***	.08**	–.08*	–.08*	–				
9. T1 Lack of Reward	1.55	0.53	–.03	.13***	.05	.10**	.05	–.05	–.06	.71***	–			
10. T1 Work-Home Interference	2.81	1.00	–.12***	.02	.04	.13***	–.004	.06*	.04	.56***	.43***	–		
11. T1 Exhaustion	2.17	0.87	–.13***	.09**	.05	.07**	.07*	–.03	.03	.60***	.48***	.47***	–	
12. T2 Work-Home Interference	2.90	0.96	–.12***	–.02	.02	.08**	.02	–.02	.10***	.44***	.34***	.60***	.40***	–
13. T2 Exhaustion	2.16	0.91	–.10***	.10**	.05	.10***	.07**	–.05	.08	.54***	.46***	.40***	.50***	.68***

Note: Model fit for the correlation model containing latent factors is: ( $\chi^2_{(97\ df)} = 173.78$ , CFI = .99; TLI = .98, RMSEA = .02).

\* $p < .05$ , \*\*  $p < .01$ , \*\*\* $p < .001$ .

**Table 2.** Model fit indices for the tested models.

	$\chi^2$	Df	$\Delta\chi^2$	$\Delta df$	CFI	TLI	RMSEA
<i>Total group</i>							
Measurement model <sup>a</sup>	498.75***	157	–	–	.97	.95	.03
Baseline model	1807.49***	253	–	–	.86	.80	.07
Direct effects model	687.43***	236	1120.06***	17	.96	.94	.04
Full model including ERI	681.43***	232	6.00	4	.96	.94	.04
Final model, significant paths only	697.71***	245	–16.28	13	.96	.94	.04
<i>Equivalence tests effort and reward</i>							
Factor loadings free across groups	206.97	96	–	–	.96	.93	.03
Full Metric invariance assumed	315.20	123	108.22***	27	.94	.91	.03
Partial metric variance effort	216.62	106	–9.065	10	.96	.94	.03

<sup>a</sup>The unique variances of two pairs of indicators of the same constructs at T1 and T2 were allowed to co-vary.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

exhaustion with a one-year time lag ( $\beta = .13$ ;  $p < .01$ ); yet no simultaneous relationship was found ( $\beta = .03$ ;  $p = ns$ ). Finally, the imbalance between effort and reward did not predict vital exhaustion over and above direct effects of effort and lack of reward (T1  $\beta = .03$ ;  $p = ns$ ; T2  $\beta = -.04$ ;  $p = ns$ ). With these outcomes, Hypothesis 1c was rejected.

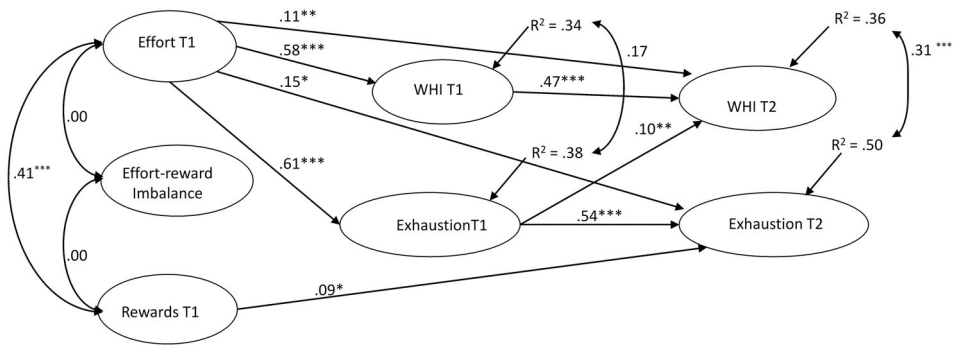
Next, we tested our hypotheses regarding work-home interference. Again, full support was found for a positive relationship between effort and work-home interference (H2a), both simultaneously ( $\beta = .60$ ;  $p < .001$ ) and one year later ( $\beta = .14$ ;  $p < .01$ ). However, no evidence was found for a direct positive relationship between lack of reward and work-home interference (T1  $\beta = .07$ ;  $p = ns$ ; T2  $\beta = .04$ ;  $p = ns$ ). This means that Hypothesis 2b needs to be rejected with our data. Finally, no support was found for Hypothesis 2c, which predicted a positive relationship between an imbalance between effort and reward on the one hand, and work-home interference on the other hand, over and above the direct effect of effort (T1  $\beta = .03$ ;  $p = ns$ ; T2  $\beta = .01$ ;  $p = ns$ ).

Next, the indirect effects' hypotheses (H3a and H3b) were tested over time. Hypothesis 3a, which predicted indirect effects via work-home interference, was rejected with our data. Although vital exhaustion and work-home interference showed correlations within measurement moments, work-home interference did not predict vital exhaustion over a one-year time period ( $\beta = .02$ ;  $p = ns$ ). In support of Hypothesis 3b, T1 vital exhaustion positively predicted T2 work-home interference ( $\beta = .11$ ;  $p < .01$ ). Since only T1 effort appeared to be associated with T1 vital exhaustion, the strength of the indirect effect of effort was calculated using a bootstrapping procedure in AMOS using 1000 bootstrapping samples. Results showed that the strength of the indirect effect was significant ( $\beta$  (indirect) = .36,  $p < .001$ ), providing evidence for a significant relationship between effort and work-home interference through vital exhaustion over time.

In sum, our results showed that effort is a more important predictor of both vital exhaustion and work-home interference, in comparison to lack of reward. Moreover, no effects were found for effort-reward imbalance over and above effort and lack of reward. Figure 1 shows the significant paths (Final Model).

### Cross-National generalizability

As a final step, we investigated cross-national generalizability of our results using the subsamples of countries with over 100 participants. First we tested Hypothesis 4a, according to which the factor structure of the ERI measure (i.e. configural invariance) and the



**Figure 1.** Final model showing significant paths between effort and reward as predictors of work-home interference and vital exhaustion for European male nurses ( $N = 1,421$ ). Relationships are corrected for age, education, number of children at home and other caring responsibilities.

strength of the path loadings (i.e. metric equivalence) would be similar across countries for the effort and reward constructs. In case the measurement instrument does not show at least partial metric equivalence, cross-country differences in relationships need to be interpreted with caution (e.g. Putnick & Bornstein, 2016). Results showed configural measurement invariance. A backward elimination procedure in which we first constrained all factor loadings to be equal across countries, after which we released factor loadings that contributed to the largest decrease in model fit one by one (cf. Millsap, 2011), indicated that the effort scale showed partial metric invariance. Fixing four out of the six observed indicators to be equal across countries did not deteriorate model fit significantly (See Table 2, further details can be obtained from the first author). No (partial) metric equivalence could be established for the reward measure. For all countries, “job security” had the strongest factor loadings, although the size of the loadings differed markedly per country. “Career opportunities” had the second highest loadings in Belgium and Germany, whereas for France and Italy this was the case for “Professional esteem”.

Next, we tested whether relationship strength per country differed from the aggregate of the remaining countries. Results showed that this was the case for three countries; models constraining relationships to be equal across samples deteriorated model fit for France ( $\chi^2_{(494\ df)} = 1295.89^{***}$ ;  $\Delta\chi^2_{(12\ df)} = 33.50^{***}$ ); Germany ( $\chi^2_{(494\ df)} = 1267.95^{***}$ ;  $\Delta\chi^2_{(12\ df)} = 37.68^{***}$ ) and Italy ( $\chi^2_{(494\ df)} = 1664.84^{***}$ ;  $\Delta\chi^2_{(12\ df)} = 35.81^{***}$ ), but not for Belgium ( $\chi^2_{(494\ df)} = 1303.94^{***}$ ;  $\Delta\chi^2_{(12\ df)} = 16.67\ ns$ ). As Table 3 shows, effort predicted both exhaustion and work-home interference at T1 in all countries. In addition, it predicted work-home interference T2 in Germany and France, and exhaustion T2 in Italy. Lack of reward predicted Exhaustion T1 only in Italy, and Exhaustion T2 only in Germany. For France, lack of reward related negatively to work-home interference T2, indicating a suppressor effect. In none of the countries did the effort-reward imbalance ratio explain any additional variance in the criteria. Note that invariance tests of relationship strength are influenced by lack of factorial invariance, including Type I error for identifying group differences (French & Finch, 2016).

In sum, analyses of the separate countries confirmed that effort is the most salient predictor of both exhaustion and work-home interference. Differences in relationship strength for rewards can be due to qualitative differences in meaning.

**Table 3.** Significant path coefficients between effort, reward, exhaustion, and work-home interference for Europe and the sub-samples Belgium, France, Germany and Italy<sup>a</sup>.

	Europe N = 1,421	Belgium N = 115	France N = 115	Germany N = 247	Italy N = 855
Effort → Exhaustion T1	.61***	.74***	.56***	.69***	.47***
Effort → Exhaustion T2	.15** <sup>b</sup>	.00 <sup>c</sup>	.00 <sup>c</sup>	.00 <sup>c</sup>	.18***
Effort → WHI T1	.58***	.68***	.67***	.77***	.53***
Effort → WHI T2	.11**	.00 <sup>c</sup>	.68***	.44***	.00 <sup>c</sup>
Reward → Exhaustion T1	.00	.00 <sup>c</sup>	.00 <sup>c</sup>	.00	.20***
Reward → Exhaustion T2	.09*	.00 <sup>c</sup>	.00 <sup>c</sup>	.22**	.00 <sup>c</sup>
Reward → WHI T1	.00 <sup>c</sup>	.00 <sup>c</sup>	.00 <sup>c</sup>	.00 <sup>c</sup>	.00 <sup>c</sup>
Reward → WHI T2	.00 <sup>c</sup>	.00 <sup>c</sup>	-.55**	.00 <sup>c</sup>	.00 <sup>c</sup>
Exhaustion T1 → WHI T2	.10**	.00 <sup>c</sup>	.00 <sup>c</sup>	.00 <sup>c</sup>	.19***

<sup>a</sup>Note that the meaning of “reward” is qualitatively different across countries

<sup>b</sup>Only this path is no longer significant for the remaining sample when the Italian sub-sample is excluded from the total sample.

<sup>c</sup>Non-significant paths are constrained to be zero.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

## Conclusions and discussion

This study set out to test the predictive validity of the effort-reward imbalance model for vital exhaustion and work-home interference among male nurses. Up until now, few studies have investigated work-home interference as a criterion in the effort-reward imbalance model. Moreover, male nurses have typically been underrepresented in nursing studies (Chan et al., 2013). Given that premature leave from the nursing profession is even higher for male than for female nurses, it is important to generate knowledge on how to prevent distressing work environments for both genders, men and women alike.

Our study showed little support for the basic premise of the effort-reward imbalance model. Rather than the occurrence of effort-reward imbalance as a predictor of vital exhaustion and work-home interference, results of moderated structural equation modelling showed that the mere existence of effort was the most important predictor, relating positively to vital exhaustion and work-home interference, both simultaneously and over time. Lack of reward related positively to vital exhaustion one year later, indicating a more gradual effect. Results additionally showed evidence for strain-based spill-over of effort into the private domain, through a process of enduring exhaustion.

Based on theoretical grounds, most studies that have tested the validity of the ERI model to date have not investigated the separate effects of effort and lack of reward, and thus results on their relative importance have remained inconclusive (Montano et al., 2016; Van Vegchel, De Jonge, & Landsbergis 2005, Van Vegchel, De Jonge, Bosma, et al., 2005). Our finding that effort was the most important predictor of vital exhaustion and work-home interference appears to be in line with the reasoning behind other, well-validated dual process models, such as the Job Demands-Resources (JD-R) model (Bakker & Demerouti, 2014), and the dual process model of work-home interference (Bakker & Geurts, 2004). According to these models, particularly job demands (i.e. those aspects of the job that cost effort and investment) and lack of resources predict energy depletion, health impairment and work-home interference. Our results are also in line with 30 years of research conducted from a general stress perspective, which shows that job insecurity has direct negative consequences for mental well-being and work-home interference (De Witte, Pienaar, & De Cuyper, 2016).

Results of prior ERI studies also seem in line with dual process models, and additionally indicate that the predictive validity of effort and lack of reward may depend on the criterion under study. Among farmers, effort was a slightly stronger predictor of stress biomarkers than lack of reward (Bathman, Almond, Hazi, & Wright, 2013). Research among nurses showed that reward frustration was the largest, if not sole predictor of intent to leave the profession, which arguably is an indicator of (diminished) motivation (Li et al., 2011; Rajacich et al., 2013). Among police officers, effort and reward frustration were equally strong predictors of work-home interference (Willis et al., 2008).

The finding that a model including effort-reward imbalance is not significantly better than the more parsimonious, additive model including only main effects of effort and lack of reward in predicting exhaustion and work-home interference confirms the results of prior ERI research (Preckel et al., 2007; Willis et al., 2008). We like to note that we have performed additional robustness checks using multiplicative instead of ratio interaction terms between effort and lack of reward, as well as models including interaction effects of specific (monetary, esteem and security) rather than global indicators of lack of reward (as recommended by Van Vegchel, De Jonge, Bakker, & Schaufeli, 2002, 2005), which like the analyses of sub-samples from specific countries, all yielded non-significant results. Our results contrast with those of a study that tested the JD-R model among home care workers (Xanthopoulou et al., 2007), in which 21 out of 32 possible interactions between demands and resources turned out to be significant. Autonomy, social support and opportunities for personal development appeared to be the strongest buffers of relationships between job demands and core dimensions of burnout. Moreover, buffer effects were most robust for emotional demands related to negative patient contacts (e.g. harassment). Possibly the restricted number of possible efforts and rewards included in the ERI model might not be the most salient ones for the current group under study.

Our finding that vital exhaustion spilled over into the private domain, predicting work-home interference one year later, but not vice versa, contrasts with results of Hämmig et al. (2012), who showed that a poor work-life balance was a stronger predictor of nurses' burnout than ERI. Moreover, our outcomes are not in line with longitudinal evidence of Hämmig et al. (2012) and Van der Heijden et al. (2008), which showed that the longitudinal relationship between demands and well-being was mediated by work-life interference. Our results rather support the view that vital exhaustion relates to ineffective attempts to cope with the situation. Vital exhaustion may relate to more negative evaluations of work and home issues (Nohe et al., 2014), and may enhance negative loss cycles of (daily) demands and self-undermining behaviour (Bakker & Costa, 2014).

### *Limitations of the study and recommendations for future research*

This study has several limitations. The first limitation is reliance on self-report measures, which may have caused common-method variance. Prior empirical evidence has shown that the ERI measure used in our study reflects actual changes in the objective situation (Tsutsumi, Nagami, Morimoto, & Matoba, 2002). In addition, by utilising a cross-lagged design, we have aimed to remedy this bias. However, including objective measures of effort and lack of reward, biomarkers of exhaustion or other-reports of work-home interference would have been stronger.

Second, the study included only two waves and effort and lack of reward were measured only during the first measurement moment. Prior research has shown that, although the effect of ERI as a predictor of mental and physical health was causally dominant, the relationship between ERI and mental and physical health is reciprocal (Shimazu & De Jonge, 2009). In order to investigate possible recursive effects or more complex waxing and waning of vital exhaustion and work-home interference, full panel designs with a minimum of three measurement moments would be needed.

Third, this study did neither differentiate between time-based, strain-based and role-based spill-over, nor test the intrinsic effort-reward imbalance thesis. Future empirical work might investigate these aspects in more detail. According to the ERI-model, over-commitment would aggravate negative effects of effort, lack of reward or effort-reward imbalance. Affective commitment, in contrast, may protect male nurses against becoming burned out (Nordam, Torjuul, & Sørli, 2005). Thus male nurses' professional commitment versus over-commitment would be an interesting avenue for future research.

Finally, it would be interesting to investigate gender differences and cultural influences in greater detail. For example, a recent study showed that men's well-being was more affected than women's well-being when they were asked to do tasks that violated identity role norms, such as tasks associated with lower status. This relationship was mediated by perceived effort-reward imbalance (Omansky, Eatough, & Fila, 2016). Such results indicate that women might have lower reward expectations and be more tolerant for lack of reward, which might protect them from experiencing strain. Based on the differences between our results and prior results among predominantly female samples (Hämmig et al., 2012; Van der Heijden et al., 2008), it can be expected that the long-term relationship between work-home interference and exhaustion may also be different.

As concerns cross-cultural influences, we only had a relatively small number of countries in our sample, with large differences in sub-sample size. The general results may therefore more accurately reflect the results of countries with larger sample sizes as compared to the other countries. Our results have proven quite robust in spite of qualitative differences in the meaning of "reward" and macro-level differences between the participating countries that may influence employees' reactions to job design differences (Parker et al., 2016). An interesting avenue for future research would be to systematically investigate possible cross-level interactions with country-level variables, which would require a larger and more balanced number of observations on a country level. Cross-cultural equivalence of the effort and reward measures would also be a point of attention for future research on cross-country differences. (Partial) factorial invariance indicates that additional latent variables relating to population differences may underlie the observed indicators rather than the presumed single latent target variable. More theory based searches for such new latent variables could be conducted instead of the exploratory backward elimination procedure used in our study (Millsap, 2011).

### *Theoretical implications*

In spite of these limitations, the results of our study have important implications for theory in this scholarly domain. First of all, we found no support for the basic premise of the ERI model that effort-reward imbalance should be the central concept of investigation. Our results are more in line with other well-validated job design and work-stress theories



(e.g. Bakker & Demerouti, 2014; De Witte et al., 2016). We therefore advise testing the effects of effort and lack of reward and their possible interaction effects separately. This would also allow for testing differential effects of effort versus lack of reward on different criteria under study, in specific work motivation versus impaired health.

Second, because the ERI model only focuses on the negative, potentially strain-aggravating effect of reward *frustration*, and not on a potentially beneficial effect of reward, the ERI measure contaminates the measurement of reward with strain, by asking respondents to indicate the “distress related to” reward frustration (Siegrist & Peter, 1996). We advocate using purer measures of whether respondents feel they are being sufficiently (or abundantly) rewarded, which would additionally enable researchers to test for possible beneficial, stress-buffering effects and motivational effects of rewarding aspects of the job.

Third, only a restricted number of possible types of effort and reward have been included in the ERI model. Moreover, the ERI measurement instrument as developed by Siegrist and Peter (1996; see also Montano et al., 2016) does not allow for testing reliably the differential effects of separate effort and reward types. Empirical evidence exists indicating that other resources might be more helpful and ought to be put in the nursing job, when dealing with specific efforts, such as emotional demands (Xanthopoulou et al., 2007). Alternatively, a more specific match might be needed between specific types of effort and reward (De Jonge & Dormann, 2006). More valid and reliable measures of the sub-dimensions of effort and reward would need to be used to investigate this contention.

### Practical implications

As concerns practical implications, qualitative evidence indicates that the impact of job stressors on long-term health is the most important reason for male nurses to leave the profession, next to the lack of job benefits and acknowledgement of their contributions (Rajacich et al., 2013). Previous studies have shown that increasing reward is an important way to prevent nurses’ voluntary exit from the job (Li et al., 2011). Our results additionally emphasise the need to focus on reducing effort in order to prevent vital exhaustion, as well as on reactive strategies aimed at recovering from vital exhaustion. Reducing strain-based spill-over of job stress into the private domain appears to be the key to maintain a sustainable workforce.

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### ORCID

Marjan J. Gorgievski  <http://orcid.org/0000-0001-8939-0321>

Beatrice I. J. M. Van der Heijden  <http://orcid.org/0000-0001-8672-5368>

Arnold B. Bakker  <http://orcid.org/0000-0003-1489-1847>

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